DRAWBOT

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This thesis is submitted as partial fulfillment of the requirements for an award of the Bachelor of the Electrical Engineering (Electronics)

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I declare this the thesis “DRAWBOT” is the result of my own research except for the works that have been cited in the reference. The thesis has not been accepted any degree and concurrently submitted in candidature of any other degree.

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"I hereby acknowledge that the scope and quality of this thesis is qualified for the award of the Bachelor Degree of Electrical Engineering (Electronics)"

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Date: 30 NOVEMBER 2007.

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ABSTRACT

This final project is entitled drawbot. It is the robot that will draw with regular marking pens on piece of paper. The project focuses on drawing a geometric shape. The objective of this project is to design the drawbot using PIC microcontroller. To make the movements for drawing, 3 servo motor is used as a joints. In this particular project, PIC microcontroller is programmed into the instructions to control the servo motor. The drawbot will be able to draw the geometric shape when the switch is initiated and then back to initial condition. This project is using the MELabs software to create the program of drawbot. This software emulator of the microcontroller will always suffer limited simulation from the combination device interaction with the circuit. This project is meant to be in industries such as drawing pattern of kain batik and logo

ABSTRAK

Projek akhir ini dinamakan drawbot. Ia adalah robot yang akan melukis di atas sehelai kertas dengan menggunakan pen dakwat tebal. Projek ini lebih menumpu kepada melukis bentuk geometri. Projek ini bertujuan untuk mereka drawbot dengan menggunakan pengawalmikro PIC. 3 servo motor akan digunakan sebagai aplikasi sambungan untuk membuat pergerakan ketika melukis. Di dalam projek ini, pengawalmikro PIC akan diaturcarakan kepada arahan untuk mengawal servo motor. Robot ini berkebolehan untuk melukis bentuk geometri apabila suis dihidupkan kemudian balik ke keadaan asal. Projek ini juga menggunakan perisian MELabs untuk mencipta aturcara robot ini. Perisian yang diseragamkan dengan pengawalmikro ini akan sentiasa mencapai simulasi yang tiada terhad daripada percantuman antara alat yang digunakan dengan litar. Projek ini juga direka dalam industri contohnya melukis corak kain batik dan logo.

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LIST OF SYMBOLS

V – Volt

cm – centimeter

N – Newton

M – Mega

T – Torque

Kg – kilogram

LIST OF ABREVIATIONS

PIC - Peripheral Interface Controller

FKEE – Fakulti Kejuruteraan Elektrik dan Elektronik

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CHAPTER 1

INTRODUCTION

1.1 Why build robot

Robots are indispensable in many factoring industries. The reason is that the cost per hour to operate a robot is a fraction of the cost per hour to operate a robot is a fraction of the cost human labor needed to perform the same function. More than this, once programmed, robots repeatedly perform function with a high accuracy that surpasses that of the most experienced human operator. Human operators are, however, for more versatile. Humans can switch job tasks easily. Robots are built and programmed to be job specific. You wouldn't be able to program a welding robot to start counting parts in a bin.

Today's most advanced industrial robot will soon become 'dinosaurs'. Robots are in the infancy stage of their evolution. As robots evolve, they will become more versatile, emulating the human capacity and ability to switch job tasks easily.

While the personal computer has made an indelible mark on society, the personal robot hasn't made an appearance. Obviously there's more to a personal

robot than a personal computer robots require a combination of elements to be effective: sophistification of intelligence, movement, mobility, navigation and purpose.

1.2 Robot

A robot is an electro-mechanical device that can perform autonomous or preprogrammed tasks. Robots may be controlled directly by a human, such as remotely-controlled bomb-disposal robots, robotic arms, or shuttles, or may act according to their own decision making ability, provided by artificial intelligence. However, the majority of robots fall in-between these extremes, being controlled by pre-programmed computers. Such robots may include feedback loops such that they can interact with their environment, but do not display actual intelligence.

For many people when heard about robot they think it is a machine that imitates a human such as the androids in Stars Wars, Terminator and Star Trek: The Next Generation, however much of these robot still only inhabit Science Fiction. This is how most people think of robots, but the robots really exist today are quite different from science fiction. Most are simply huge metal arms controlled by a controller. The type of robot that most frequently do the work are like too dangerous, boring, onerous, or just plain nasty. The robot can be found in auto, medical, manufacturing and space industries. In fact, there are about over million types of robot working for daily life today. The robots come in many shape and sizes and have their own abilities. Basically, a robot is simply use controller with some sort of mechanical body design to do the task or particular job. Usually it is able to move and has one or more electronics senses. Robotics is the science of studying and creating robots. It is a very broad and interesting science, because like humans,

robots have many fascinating aspects. Robotics has been a real science only since the 1970's [1].

1.3 Overview of the drawbot

For this project, drawbot that were developed have a postion in industries applications. Nowadays, many of Textiles industries employ the human or people ti design or draw the pattern of 'kain batik using the ability or skills of each worker. By the way, this drawing job is not our concern occupations. But they must give a 100 percent concentration in their job to make a perfect design. However, human is not perfect to perform 100 percent. They also have a different mood in every time. Let see if they are in bad mood or poor condition, what happen in their job? Maybe they did the design as simple as they like and do not execute perfectly. This can influence the quality of design and make a lot of production wasted.

That's why we need an innovation of technology to convey an advantage of our industries. So this type of drawbot is suitable for our innovation to replace the human source to design and draw the pattern of 'kain batik'.

There are a lot of benefits if we submit an application to these innovations such as we can reduce the human salary and change the manufacture into our productions. Beside that, we can increase the productivity of the product and have a best production for the future development.

1.4 Objective of the project

PSM is a subject that require student to make their own project based on what they learn. So, there are several objective in this project that is;

- Design the drawbot using PIC microcontroller
- Able to program the movement of 3 servo motor

1.5 Scope of the project

In this project, there are several scopes that must achieve. Refer to the block diagram below, this project are using PIC microcontroller as a brain to interface output an input hardware. Remote as the input and servo motor movement as an output. The main scope for this project is drawbot is able to sketch the geometric shape.

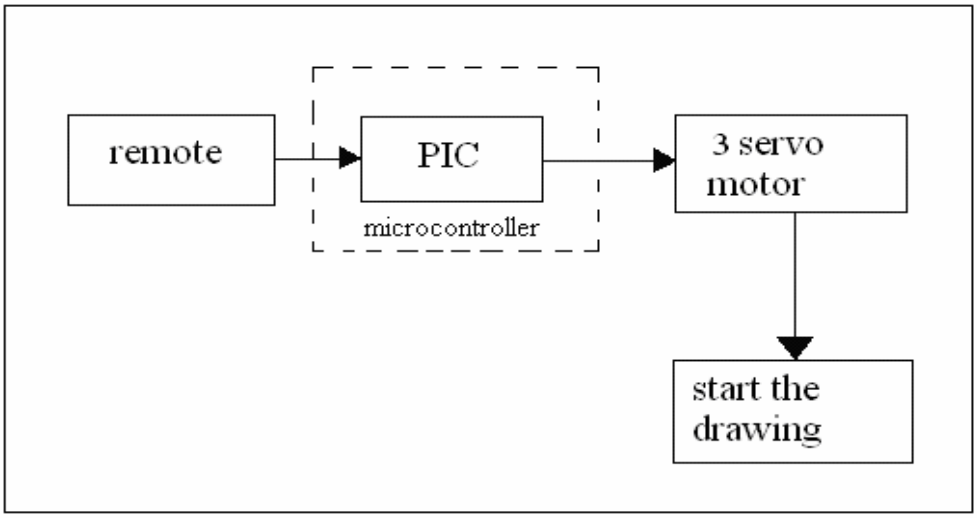

Figure 1.1: Drawbot Block Diagram

1.6 Organization of the thesis

Chapter 1 described about the basic overview or background of drawbot includes their benefits for the futures.

Chapter 2 explains about the literature review for the project as a reference during the project design, development and the implementation. The literature review covered like previous thesis, journal, books, experiments and any material which is give a good idea for the project development process.

Chapter 3 explains about methodologies or the step for the progress of the project. This chapter covered about the project design, component used, flow chart for the project progress and flow chart for the software development and this chapter also confirm which part or module need to be done first

Chapter 4 showing the results obtained from all the testing process and the result will be analyzed in this chapter. The result will be analyze to confirm the project realization and to make sure the result follow or fulfill the requirement in the task given

Chapter 5 discusses the conclusion for the navigation of the drawbot project, this chapter will conclude all the result and will confirm whether the project is successfully developed or not. The costing and recommendations and the better idea for the future development also included in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will describe about the knowledge of drawbot or the literature review which is as a reference before develop this project, literature is one of the important part need to be consider before develop new project because it can be a good reference which is give a lot of information, theories, design and idea about the project develops. Literature review can be an article, journal, statement, research and the previous thesis done by others. Below show a few literature review referred before develop this project.

2.2 Drawbot 1.0

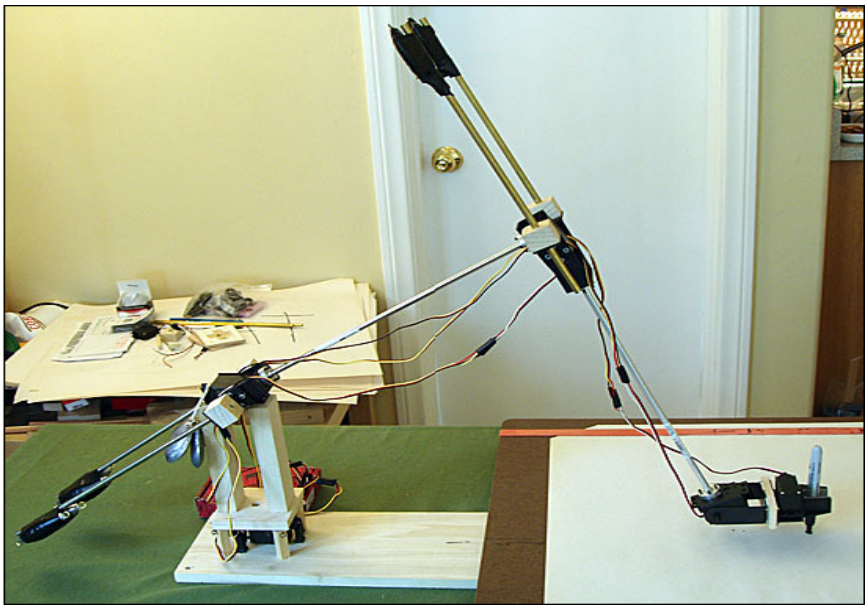

Figure 2.1: Drawbot 1.0

This reference build the drawing robot as same as this project. This robot is quite simply, a drawing robot. More specifically, it is a 30” robotic arm with shoulder, elbow and wrist joints. It is mounted on an easel like horizontal platform and it is capable of picking up and drawing with regular marking pens on pieces of paper up to 15”x 20” [2].

2.2.1 Interface

Drawbot is accessed with easy to use software that runs on any Windows PC with a USB port. By moving the mouse around the screen, the user controls the corresponding position of the pen over the easel. Tapping the space bar raises and lowers the pen onto the paper surface.

An exciting feature of the software is that the user can choose to record his or her session for playback at a later time. In this way, a nearly-exact copy of the original drawing is produced. Drawbot is highly skilled at retracing its earlier steps.

The potential for Drawbot to produce perfect geometrical shape, text and fonts of various styles, and even pointillist images, is nearly infinite. But no matter what input is used the process of creating artwork is as engaging as the final product itself. Drawbot is not a painter, but a performer [2].

2.2.2 Electronic and Mechanical Design

This robot is using PIC18F4550 microcontroller as a main control system with full speed USB 2.0 connectivity. It also uses standard motors to recreate the rotational motion of the human arm [2].

The DrawBot "bones" (upper-arm, forearm, and counterweights) are made out of lightweight 1/4" steel, brass, and aluminum tubing available at any hardware store. Much of the connecting hardware is available in prefabricated brackets made especially to mount servos and connect them with shafts or other servos [2]. A total of five "joints" are used in the DrawBot: two at the shoulder for up-down and left-right movement; one at the elbow to control the bending of the arm; and two at the wrist to control the rotation, and the gripping action, of the fingers. This freedom of movement allows DrawBot to pick up any sort of marking pen (as long as the cap is already off) and press it to the paper surface.

2.3 Servomotor